Use of Maximum Incremental Reactivity in CaRFG Program

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California Environmental Protection Agency

Air Resources Board

Overview

- California's RFG Program
- Predictive Model
- Use of MIR in Evaluating Reactivities of Various Emission Processes

California Reformulated Gasoline (RFG) Program

- California Reformulated Gasoline implemented
  - Phase 1 RFG - 1992
  - Phase 2 RFG - 1996
  - Phase 3 RFG - 2003
  - Amendments to Phase 3 RFG -2007
- Phase 3 RFG eliminated MTBE from California gasoline and facilitated a significant increase in the use of ethanol – 900 million gallons per year

Predictive Model

- Allows for certification of alternative formulations
- Uses mathematical equations to demonstrate that alternative formulations preserve the emissions benefit of the program
- Producers must preserve benefits of RFG
- Uses MIR values to allow trade-offs between various emission processes on a reactivity adjusted basis

Predictive Model – Emissions Type Included

- Evaporative emissions
  - Hot soak
  - Diurnal/Resting
  - Running loss
- Permeation emissions
- Exhaust emissions
  - CO
  - Hydrocarbons

Emissions Data

- Extracted sample exhaust speciation data set from ARB VEDS database
- Hot Soak and Diurnal speciated sets obtained from ARB surveillance testing program
- Running loss speciated set calculated
- Permeation data from CRC E-65 study

Gasoline

Reactivity Factors for the Various Emission Processes Based on the 2006 MIR List

Process	Average Reactivity
Diurnal	2.74
Hot Soak	3.12
Running Loss	2.73
Permeation	2.77
Exhaust CO	0.06
Exhaust TOG	4.01

2007 Predictive Model

2010 Statewide (Tech 1-5, GVW<10,000 lbs)

Pollutant	Emission (tpd)	MIR	OFP (tpd)	OFP (%)
Exh TOG	244.3	4.01	979.6	51.3
CO	4388	0.06	263.3	13.8
Evap TOG				
DI/RT	68.1	2.74	186.6	9.8
HS	42.1	3.12	131.2	6.9
RL	128.4	2.73	350.5	18.3
Perm	18.4	2.77	51.4	2.7

Summary

- **MIR values play an essential role in providing producers flexibility to produce gasoline in CA while preserving the benefits of the CaRFG program**